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Improved Method for Design of Expansion-Chamber Mufflers With Application to Operational Helicopter

The problem:

The noise levels allowed by mufflers in internal-combustion engines needed to be lowered.

The solution:

An improved method for the design of expansion-chamber mufflers has been developed, and it has been applied to the task of reducing the exhaust noise generated by a helicopter.

How it's done:

The method is an improvement of standard transmission-line theory, in that it accounts for the effect of the mean exhaust-gas flow on the acoustic transmission properties of a muffler system, including the termination-boundary condition. The method has been computerized, and the computer program includes an optimization procedure that adjusts muffler-component lengths to achieve a minimum, specified, desired transmission loss over a specified frequency range.

A field test of a muffler designed with the aid of this method was conducted on a helicopter with a known exhaust-noise problem. When the exhaust noises of the

helicopter with a standard exhaust system and of a similar helicopter with a muffler system installed were compared for hover-flight conditions, the muffler system was found to reduce the exhaust noise by approximately 11 dB. No significant degradation in engine performance was observed.

Notes:

1. The program was written in FORTRAN IV for the CDC 6000 series computer. A printout of the program is available, together with a user-oriented description.
2. Inquiries concerning this program should be directed to:

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